

Assessment Overview: Regional Impacts of Using the Day Cloud Phase Distinction RGB for Lightning IDSS

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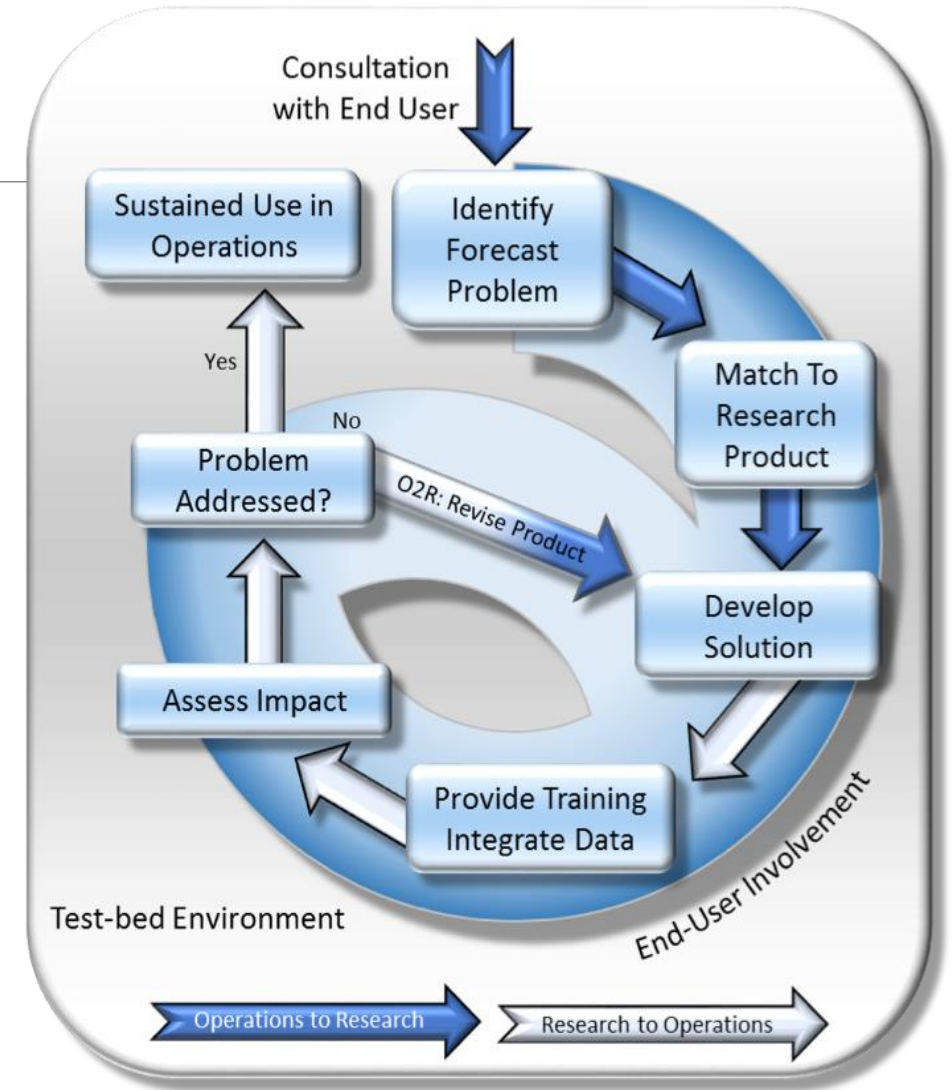
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NASA SPoRT

Research to Operations Chasm

- How do you get promising, cutting edge research to decision makers?
- How do you know what's promising?
- How can researchers learn what is needed in ops?
- What products, in what formats, at what latency, etc.?
- Who transitions and maintains the product?
- Who provides resources for all this?

Successful R2O/O2R requires intentionality.



NASA SPoRT

Current SPoRT “research-to-operations” Thematic Areas:

Research Areas:

Tropical
Meteorology

Atmospheric
Remote Sensing

Lightning/
Convection

Air Quality /
Human
Health

Land Surface
Remote
Sensing

Machine
Learning

Transition Activities:

End-User
Training

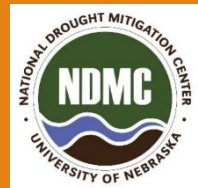
Product
Assessments

Data
Production

Current Partners



FEMA



Day Cloud Phase RGB: Quick Basics and Motivation for Our Study

The DCP Distinction RGB helps users efficiently distinguish between cloud types using the 10 μm (red), the .64 μm (green), and the 1.6 μm (blue).

One purpose of the RGB is to help users identify glaciation in clouds, anticipating convection...

...and also lightning (?)

Elsenheimer and Gravelle (2019) provided an excellent methodology and scientific justification for doing just that: in Florida, the NWS CWA was using the RGB to help inform lightning IDSS guidance.

Our question: Can this method be generalized to all CWAs?

And some follow-ups, because we are very thorough: Is the method impacted by viewing angle or other differences in GOES-E and GOES-W? Is the nature of convection and lightning similar enough that this method is reliable throughout the country?



Read Elsenheimer and Gravelle 2019

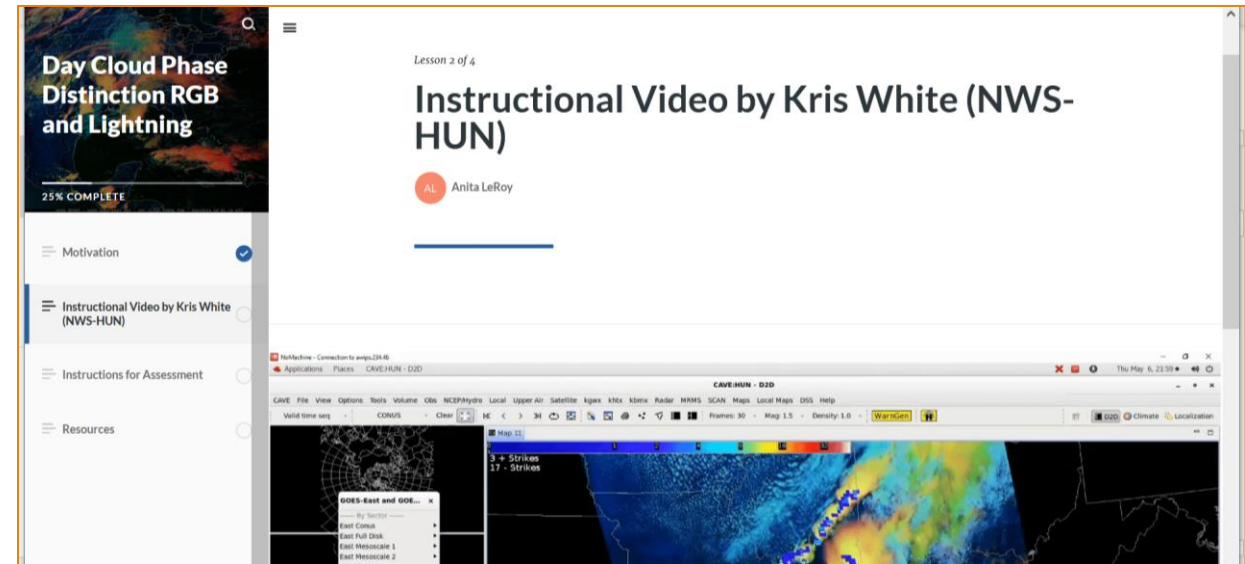
Assessment Methodology

Solicited feedback from NWS forecasters all throughout the country.

Asked some “utility” questions: E.g., could you identify glaciation in the RGB?

Asked some more technical questions, in case we needed to learn more about what they were seeing in the RGB to understand potential regionality.

- E.g., what was the max -10C reflectivity in the cell you observed (if available)? What was the lowest 10 um temp?



Brief overview of the DCP RGB and the objectives of the assessment.

Assessment Methodology (cont.)

* Note that we understand these specific quantitative questions potentially spook the participants. We never want our feedback forms to feel like a pop quiz. This is ultimately still social science; we sought to understand what the user could quickly perceive while performing their tasks at the forecast desk.

** In other words, please do not examine these results and assume a level of scientific rigor that we did not intend and didn't ask for.

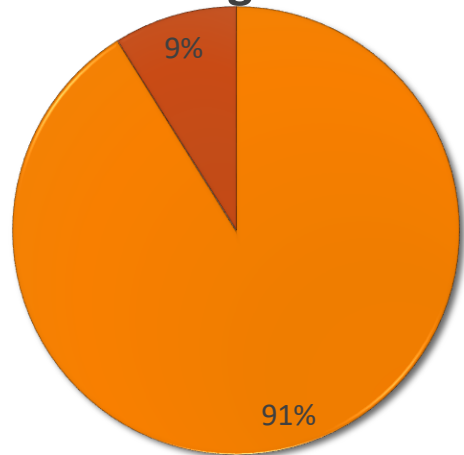
Forecaster Demographics

Feedback received	CWAs Observed*	Forecasters	Regions
46	18	16	5 (ER, CR, SR, WR AR)

***They could observe convection wherever they wished.**

Feedback on Utility

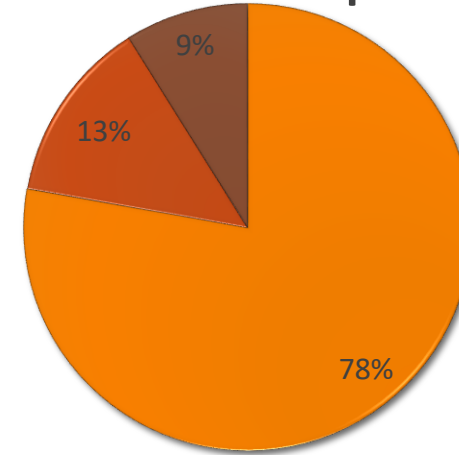
Were you able to easily interpret the DCP RGB to see glaciation?



■ Yes ■ Yes/Maybe, with caveats

Caveats mainly point to the subjective nature of RGBs. We also expect that, over time, forecasters become increasingly familiar with RGBs and confidently interpret them.

Would you have been able to use glaciation in the DCP RGB to anticipate lightning?

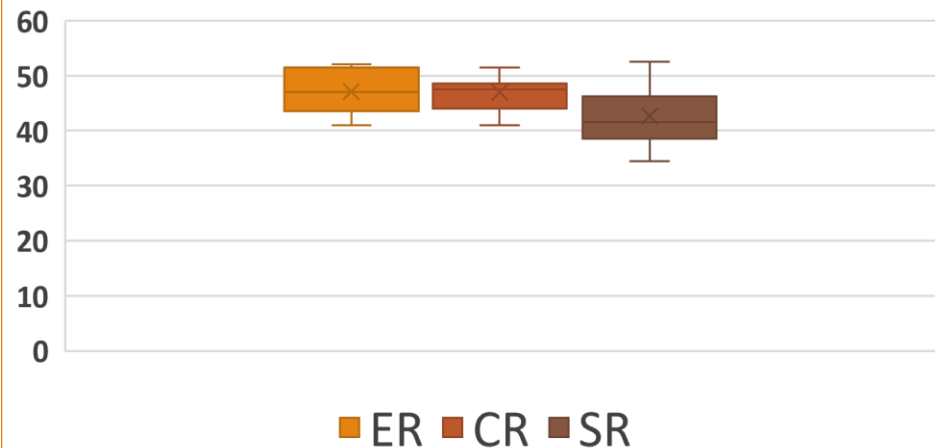


■ Yes ■ Yes/Maybe, with caveats ■ No

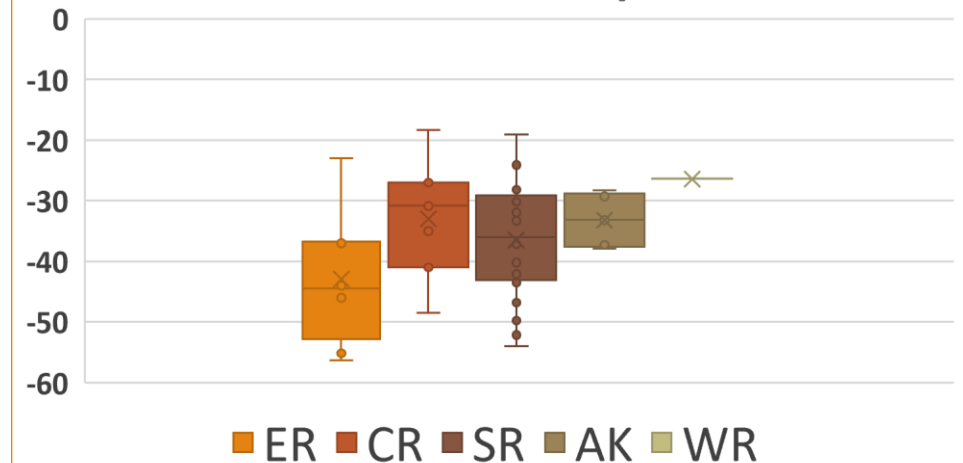
More caveats and some “no” answers here. Some issues were not being able to discern which cells were related to lightning that happened several minutes later in larger fields of convection.

Feedback on Sat Obs

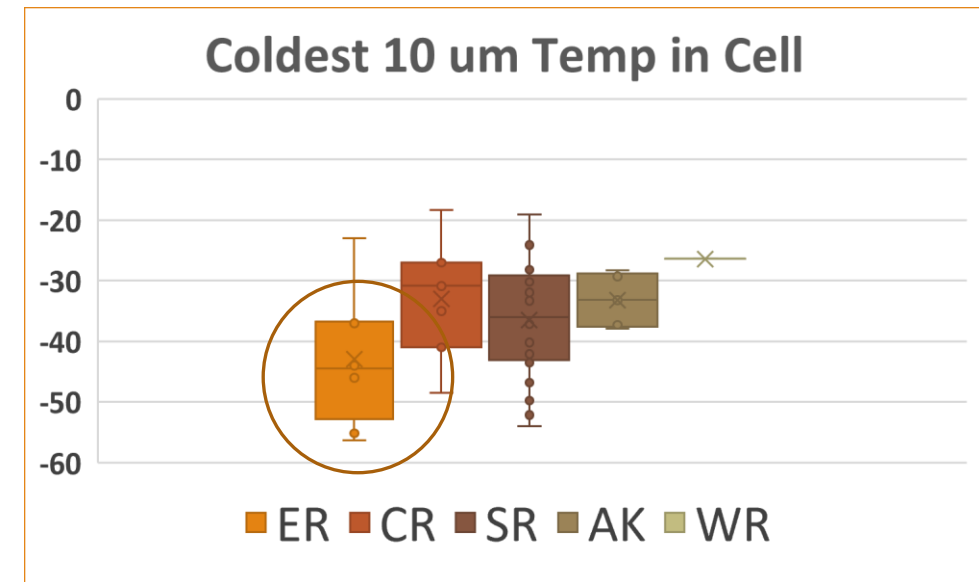
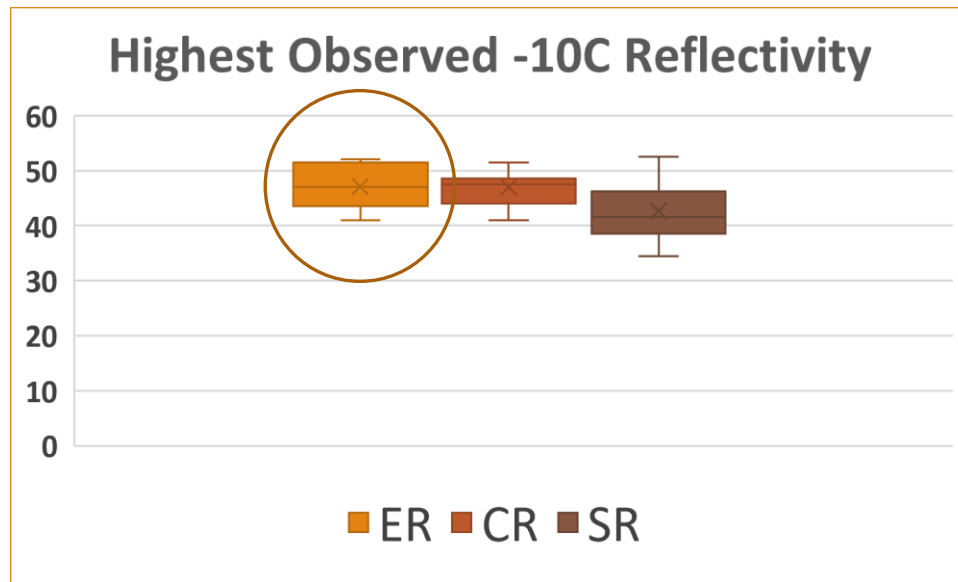
Highest Observed -10C Reflectivity



Coldest 10 um Temp in Cell

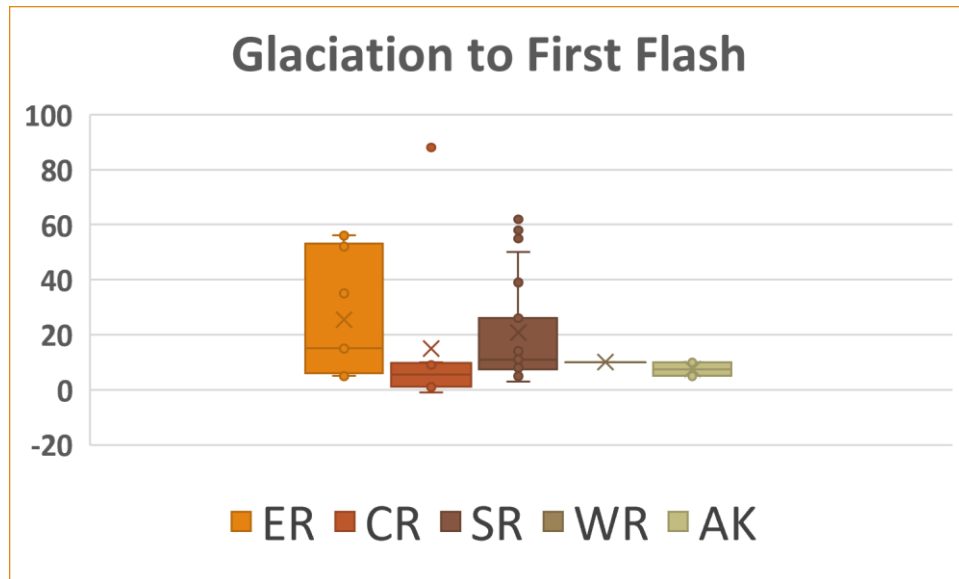


Feedback on Sat Obs



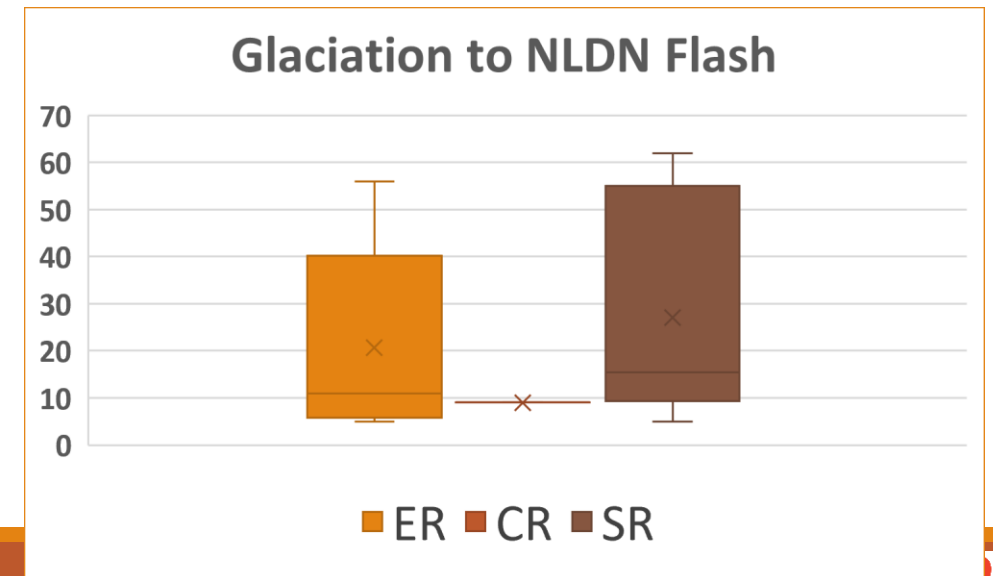
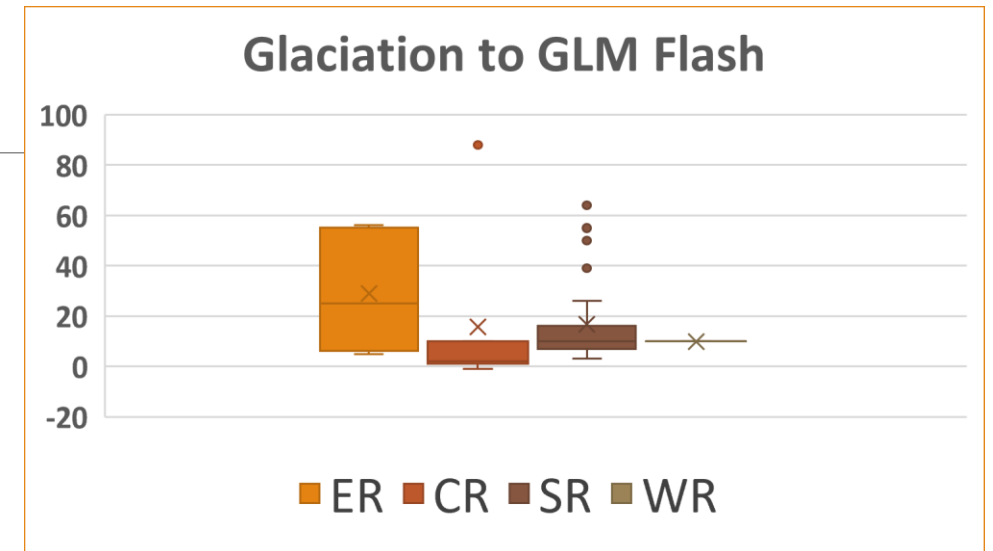
Are the observations from Eastern Region looking a little different from the others?

Lead time from observed glaciation to first flash



AK uses GLD360.

Broad range of lead times in all regions.



Regionality? It is suggestive, but...

Rank sum tests tell us that we can assume some regionality in these results if we are willing to risk being wrong 10% of the time. (W_{crit} at $\alpha = 0.1$)

So, while it looks interesting, it might just be an artifact of sample size. (And remember my caveat about this not being a super rigorous evaluation on our forecasters' shoulders.)

How about sampling?

In SR, there is a good mix of 5- and 1-min GOES observations.

Again, a little suggestive, but again, rank sum tests indicate, e.g., higher reflectivities in 1-minute data only at 10%.

...But it still makes us curious...

Conclusions and future work

Forecasters in all regions felt mostly comfortable identifying glaciation in the DCP RGB.

Forecasters in all regions felt mostly comfortable using the DCP RGB to anticipate lightning risk for IDSS.

Glaciation preceded lightning in almost all events; lead times over ten minutes.

Sometimes there wasn't clarity on what cells to focus on amid broad convective activity, which might impact the utility of this method.

- Then again, for IDSS, you are usually forecasting for a specific, limited area.

Sometimes, lightning came a long time after glaciation. This could reduce forecaster confidence in using this RGB for anticipating lightning.

Given our small sample size, we can't rule out the possibility that there is a difference in regions or GOES instruments. E.g., ER forecasters indicated (perhaps) higher reflectivities and lower 10 um cloud top temps. 1-min data (perhaps) resulted in slightly higher reflectivity observations.

We'd love to examine this more rigorously, if the opportunity arises.